Candidate Parent Craters for the Martian Meteorite ALH84001

J.W. Rice, Jr. (Arizona State Univ.)

ALH84001 is an ancient, coarse-grained, igneous rock, namely a cumulate orthopyroxenite, with a crystallization age of 4.5 Ga (Mittlefehldt, Meteoritics, 29, 214-21, 1994; Mckay et al., Science, 273, 924-30, 1996). This sample records evidence of two shock metamorphic events (impacts), separated by thermal metamorphism and low temperature chemical alteration events (Treiman, Meteoritics, 30, 294-302, 1995). Therefore, based on ALH84001's significant age (4.5 Ga) and history of multiple shock events (crater impacts), it seems quite reasonable to assume that the rock formed in an ancient region (Noachian Age) of the martian surface, specifically the cratered highlands.

The following criteria were established to locate candidate parent craters for ALH84001: 1.Identification of a young, pristine crater defined by sharp, well preserved rims, steep walls, deep and rough floors, and extensive well preserved ejecta blankets. The crater is 16 Ma old based on the cosmic ray exposure age of ALH84001. This would result in a very fresh crater. Therefore, there should be no impacts superposed on crater and ejecta materials of the parent crater. 2.Crater emplacement upon Noachian Age geologic materials. 3.Crater diameters range from 10 - 30 km; no larger craters fit the morphologic criteria of young craters.

A photogeologic search was conducted using the 1:2M scale photomosaic data set of basemaps and individual Viking Orbiter images which cover the appropriate geologic terrains (photomosaic maps MC-3 thru MC-30). This analysis produced 20 candidate craters. The leading candidate is a 10 km diameter oblique impact crater located in the Memnonia region of Mars near Mangala Valles.

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Paper presented by James W. Rice, Jr.
Arizona State University
Department of Geography

Tempe AZ 85287 USA
Phone: 602-965-1790
Fax: 602-965-1787
Email: asjwr@asuvm.inre.asu.edu

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